

AD-A103 626

WISCONSIN UNIV-MADISON GRADUATE SCHOOL OF BUSINESS

F/G 5/1

COGNITIONS OF WORK UNIT STRUCTURE (U)

AUG 81 R BLACKBURN, L L CUMMINGS

N00014-79-C-0750

UNCLASSIFIED

TR-1-1-9

NL

END

DATE

FILED

10-81

DTM

LEVEL II

①

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER 1-1-9	2. GOVT ACCESSION NO. AD-A103 626	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Cognitions of Work Unit Structure		5. TYPE OF REPORT & PERIOD COVERED Technical Report - 9
6. AUTHOR(s) Blackburn, Richard and Cummings, Larry L. University of North Carolina and Northwestern University		7. PERFORMING ORG. REPORT NUMBER 1-1-9
8. PERFORMING ORGANIZATION NAME AND ADDRESS Graduate School of Business Dr. L.L. Cummings University of Wisconsin Dr. R.B. Dunham Madison, WI 53706 Co-Prin. Invest.		9. CONTRACT OR GRANT NUMBER(s) N 00014-79-C-0750
10. CONTROLLING OFFICE NAME AND ADDRESS Organizational Effectiveness Research Programs Office of Naval Research (Code 492) Arlington, VA 22217		11. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR 170-892
12. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. REPORT DATE 17 August 1981
		14. NUMBER OF PAGES 124
		15. SECURITY CLASS. (of this report) Unclassified
		16a. DECLASSIFICATION/DOWNGRADING SCHEDULE
17. DISTRIBUTION STATEMENT (of this Report) Approved for public release: distribution unlimited		
18. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
19. SUPPLEMENTARY NOTES To appear in the <u>Academy of Management Journal</u> , 1982.		
20. KEY WORDS (Continue on reverse side if necessary and identify by block number) work unit structure, dimensionality of structure, cognitive perspective, social definitionist perspective		
21. ABSTRACT (Continue on reverse side if necessary and identify by block number) An improved conceptual and empirical approach to identifying dimensions of work unit structure is proposed and tested. Multidimensional scaling procedures utilizing input data from 180 unit respondents recover a perceptual map of work unit structure. Interpretive analyses suggest that participants differentiate work unit structure along five dimensions: bureaucratic, affective, interaction, function and size. Both substantive and methodological advances are claimed.		

AD A103626

DTIC FILE COPY

DTIC
ELECTE
SEP 2 1981
D

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 68 IS OBSOLETE
S/N 0102-LP-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

411760

COGNITIONS OF WORK UNIT STRUCTURE

Richard Blackburn

University of North Carolina

and

L. L. Cummings

Northwestern University

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

Technical Report Number 1-1-9

August 1981

DTIC
ELECTE
SEP 2 1981
S D

Reproduction in whole or in part is permitted for any purpose of the United States Government. This report was sponsored in part by the Organizational Effectiveness Research Program, Office of Naval Research (Code 452), under Contract No. N00014-79-C-0750, NR 170-892 with Dr. L. L. Cummings and Dr. R. B. Dunham, University of Wisconsin-Madison as Co-Principal Investigators.

81 9 01 043

Cognitions of Work Unit Structure

Abstract

An improved conceptual and empirical approach to identifying dimensions of work unit structure is proposed and tested. Multidimensional scaling procedures utilizing input data from 180 unit respondents recover a perceptual map of work unit structure. Interpretive analyses suggest that participants differentiate work unit structure along five dimensions: bureaucratic, affective, interaction, function and size. Both substantive and methodological advances are claimed:

The impetus for this study of cognitions of structural dimensionality developed from two concerns. The first was the authors' general concern with the apparent domination in organizational research of a perspective that has been variously labeled "rational" (Benson, 1977), "social factist" (Pondy and Boje, 1976) and "functionalist" (Morgan, 1980). This research paradigm has led to the treatment of organizational characteristics (i.e. structure, technology, etc.) as objective realities "capable of being measured, described, and included as elements in causal explanations" (Pondy and Boje, 1976, p. 20). While such an approach has provided a wealth of organizational knowledge, it will be argued shortly that an alternative perspective exists which can provide equally valuable information.

Our second concern was with the theoretical and empirical underpinnings of the early work on the dimensionality of structure. This concern evolved from our perceptions of the premature acceptance by many organizational analysts of a limited but operationalized set of structural dimensions for use in empirical research. We were also struck by the apparent willingness of some to suggest that closure could now be achieved concerning the probable domain of structural dimensionality (Child, 1974, Van de Ven, 1976; Hall, 1978).

The purpose of the research reported here is to consider an alternative and complimentary research perspective in the analysis of organizations and to present a methodology designed in the spirit

of the alternative paradigm. Our intent is to re-examine the question of structural dimensionality from a cognitive rather than a deterministic perspective.

The Traditional Perspective and an Alternative Approach

Much of the research conducted in the organizational sciences has been dominated by what Pondy and Boje (1976) contend is a "social factist" paradigm (Ritzer, 1975). This perspective encourages researchers to view participants as "metering devices" capable only of responding to interviews or questionnaires (Pondy and Boje, 1976, p. 12). Constructs so measured are assumed comprehensible and relevant to the participant with the researcher simply assessing participant perceptions of the extent to which a construct exists in the work setting.

The dominance of this perspective is clearly visible in the major investigations of structural dimensionality (Pugh, Hickson, Hinings and Turner, 1968; Child, 1972; Reimann, 1973; Holdaway, Newbery, Hickson and Heron, 1975). In each of these studies individuals responded to a set of a priori defined structural variables. These responses were then factor analyzed to reveal a number of "structural dimensions."

The four studies identified above have been subject to criticism on both empirical and conceptual grounds. For instance, McKelvey (1975) criticized the work of Pugh, et al. (and by inference the

attempted replications) for inappropriate sampling procedures, inadequate sample sizes given the nature of the multivariate statistical procedures employed, and an incomplete discussion of the criteria used in the selection and interpretation of the component solutions. Blackburn (in press) identifies a serious conceptual problem with these studies. The problem concerns Pugh, et al.'s initial imposition of conceptual constraints on the potential outcomes of the multivariate analyses. By limiting the "primary" structure dimensions to those of an essentially Weberian model, the researchers limited the possible dimensional outcome. James and Jones (1976) and Schwab (1980) caution that such an approach immediately constrains the number and type of dimensions measured, as well as the underlying components which could result from any data reduction technique.

Utilizing the research perspective of the social factist and its heavy reliance on researcher specified measures, some underlying structural dimensions may remain unidentified, since they were not elements of the original research framework. As Karmel and Egan argue,

"It is not enough to hypothesize the existence of certain dimensions, ... and then build instruments which depend on the validity of the initial assumptions about dimensionality." (1976, p. 323)

Recently, a number of authors have suggested that what is needed in the organizational sciences in general (and we would add in

structure research in particular) is an alternative perspective to the investigation of organizational phenomena (Pondy and Mitroff, 1980; Morgan, 1980). One alternative is what Ritzer (1975) calls the "social definitionist" perspective. Rather than focusing on objective facts gathered from organizational "metering devices," the definitionist focuses on participants' definitions of the work environment as the research interest. From a social definitionist perspective, organizational members become actively involved in defining, describing and/or enacting their work environment. Pondy and Boje (1976) apply Ritzer's paradigmatic conceptualization to organizational theory by advocating the elevation of the "definitionist" paradigm to a position of parity with the facist perspective.

What follows is a discussion of an empirical procedure designed to satisfy the critics of past dimensional research and the advocates of greater participant involvement in construct definition. It should be noted that what is reported may not necessarily be a better approach to dimensionalizing structure. It is, however, an alternative and a complementary approach by which fresh insights into this phenomenon can be obtained. The research is couched in more rigorous empirical procedures than might appeal to the classic ethnomethodologist. Nevertheless, we believe it is sufficiently non-positivistic to satisfy the definitionist desire to allow participants to determine "the meaning in a situation to those involved in it, rather than imposing, a priori the researcher's meaning" (Pondy and Boje, 1976, p. 10).

Determination of an individual's meaning about structure could be made in two ways. One could adopt a strict definitionist perspective and simply ask individuals to define those characteristics they use to describe the structures of particular entities. However, this process assumes 1) that participants are able to recall and verbalize those characteristics; 2) that clarifications of responses would not result in the "priming" of respondents by the researcher; and 3) that analysis and interpretation of results would not be unduly contaminated by researcher biases.

Alternatively, one could use a modified procedure designed in the spirit of the social definitionist perspective but more empirically rigorous than the typical phenomenological approach. This methodology is multidimensional scaling (MDS). This technique seems eminently appropriate if one is willing to assume that the structures of organizations or work units consist of a set of possible structural attributes. It must also be assumed that for any individual in an organization only a limited number of these attributes will be salient when the individual considers the structure of an organization or work unit. That is, only certain of these attributes will influence an individual's perceptions of structure. These attributes could be thought of as cognitive dimensions of structure.

The use of MDS in the organizational sciences has been limited. Three recent studies have investigated the dimensions of perceived social structure within a research laboratory (Jones and Young,

1972), a business school (Salancik, Calder, Rowland, Leblebici and Conway, 1975), and a psychology department (Kaman, Shikiar and Hautaluoma, 1979). In each of these studies, measures of association between various entities were analyzed and physical representations (often called "maps" or "solutions") were generated such that distances between entities in any solution were monotonically related to the measures of association used as input data. These solutions were interpreted to be the organizational social structure as perceived by participants. The dimensions underlying a particular representation can be viewed as cognitive dimensions of the social structure.

The present research provides a work unit analogue to organizational social structure by arraying work units (rather than individuals) in a perceptual space common to respondents. Such a space will be defined by those dimensions used by participants to describe or define work unit structure. Hence, these dimensions become the cognitive dimensions of work unit structure.

MDS provides a means by which these salient dimensions can be recovered and identified. In doing so, MDS allows the attributes of structure to emerge via the scaling process as opposed to being specified a priori by the researcher (Guzzo, 1977). Thus, it is extremely useful for identifying the dimensionality of a construct in a manner relatively free of researcher bias.

METHOD

Sample

The sample was drawn from a population of 260 full-time exempt and non-exempt employees of a production/distribution facility in a major metropolitan area of the upper-Midwest. Impending contract negotiations and operational considerations prevented union employees and members of one functional department (N = 40) from participating. Of the 220 employees available, 180 (82%) provided usable survey results. The sample included employees from across hierarchical levels, functional units and operating shifts. A brief summary of some key demographic variables is presented in Table 1.

Insert Table 1 About Here

Procedure

All participants completed a two-part survey administered by the first author to groups of 5-20 employees on company time. Each session lasted about 90 minutes. Employees were guaranteed both anonymity and confidentiality of their responses.

Part One of the survey contained the MDS task. To provide the required input seventeen work units were selected for evaluation. Two criteria were used in selecting these units: 1) the desire to include units from across all functional areas; and 2) the desire to insure participant familiarity with most of the units selected.

Those units chosen represented about 75% of all identifiable work units in the organization, and they ranged in size from 5-150 employees. The names used in the data collection were those which a group of key organizational members indicated would be the titles most likely used by employees when discussing the work units.

Work units, rather than organizations were chosen for research purposes to increase the probability of participant familiarity with the entities in the MDS task. As Pierce, Dunham and Blackburn (1979) note, there is considerable conceptual and empirical evidence to suggest that like organizations, work units also have a multidimensional structure which can range from mechanistic to organic.

Using a nine-point rating scale (1-very similar to 9-very dissimilar) participants responded to the following instructions:

"For each pair, please circle the number which best indicates the extent to which you feel each of the units in the pair is similar or dissimilar to the other on the basis of the way you think the units are structured."

During actual data collection one-half of the sample was randomly assigned to a condition in which the MDS instructions merely requested comparisons based on "unit structure". Respondents were free to define and dimensionalize structure in any manner deemed appropriate. The remaining half of the respondents were provided with a series of definitions of structure on which to base their

comparisons. These definitions represented a cross-section of definitions which have appeared in recent articles and textbooks. A number of definitions were included in an attempt to provide a broad and hopefully unbiased perspective of the construct. It is argued that the definitions neither defined nor delimited the dimensions which individuals could use to make their comparisons. Rather, the definitions served to focus the respondent's thinking and allow the salient structural dimensions to evolve based on a concept which may be present in the mind of the respondent but whose dimensions cannot be adequately verbalized.²

Respondents made 144 paired comparisons. This number reflects all possible pairs of 17 units (136) plus eight comparisons presented in reverse order of their initial presentation (i.e. Unit A vs. Unit B and Unit B vs. Unit A). These reversed pairs were included to test the stability of responses within the measurement instrument. Comparisons were presented randomly on each survey page, and pages were randomly ordered within each questionnaire.

Respondents were also asked to rate their relative familiarity with each unit compared (1-very unfamiliar to 7-very familiar), and their confidence in being able to make the comparisons on the basis of unit structure (1-no confidence to 7-very confident). In the last section of Part I respondents were given the opportunity to state in their own words the unit characteristics that they had used in making the paired comparisons. To prevent contamination across parts of the survey, Part One was collected prior to the distribution of Part Two.

The open-ended question concluding Part One and two sections of Part Two were specifically included to provide information for later use in the interpretation of the dimensions revealed in the MDS analysis. Given our interest in the extent to which traditional structural dimensions might accurately represent characteristics used by individuals in describing work unit structures, specific opportunity was provided respondents to indicate the relative importance of a set of traditional characteristics in making the comparisons. These characteristics included elements previously described in the literature as dimensions of structure. Thus, respondents used a 7-point scale (1 - very unimportant to 7 - very important) to rate the importance of the number of 1) employees in a unit (size); 2) different jobs in a unit (complexity); 3) standard operating procedures in a unit (standardization); 4) written rules, policies, or procedures in a unit (formalization); 5) decisions made outside of a unit (centralization); and 6) supervisors in a unit.

Respondents used the same scale to rate the importance of 1.) unit performance; 2.) satisfaction/climate within a unit; and 3.) the nature of the unit's product/service in the comparison process. Importance of these three attributes would suggest the extent to which individuals dimensionalized structure with characteristics not traditionally thought of as structural. In particular, the unit satisfaction and climate scales were included for two reasons. First, in the formative stages of this research it was suggested that perceptions of unit satisfaction/climate would dominate any

cognitive map of structure that was identified (Note 1). It was considered appropriate to examine this contention empirically. Second, there is evidence in the research on cognitions of social structures among individuals that an evaluative dimension is almost always present (Kim and Rosenberg, 1980). It was of particular interest to examine whether similar results would occur in a work unit analogue to this individual research. For example, would units described as extremely formalized be evaluated in a positive/negative manner?

In the second section of Part Two, employees were asked to describe their perceptions of each of the 17 work units using the same list of a priori characteristics. These descriptions were collected using bipolar adjective scales (i.e. large-small, many-few different jobs, etc.). It should be emphasized that these ratings were made after the comparison judgments. The actual influence of the characteristics on a cognitive model of structure can only be judged by examining the MDS results.

Measures of unit structural characteristics were also obtained from unit supervisors. This information was collected using an adaptation of the Pugh et. al. (1968) instrument and included measures of standardization, specialization, formalization, centralization, complexity, and stratification.

Four weeks after the initial data collection, a re-test of both employees and supervisors was conducted. Five randomly selected supervisors again completed the supervisor questionnaire, while a

random sample of 30 employees who had participated in the first survey completed a shortened version. The only difference between the two employee surveys was a reduction in the number of paired comparisons. This reduction was achieved by randomly choosing nine of the original 17 units for inclusion in the retest. Forty paired comparisons were included, all possible pairs (36) plus four comparisons in reversed order.

ANALYSES

MDS Solutions

The KYST multidimensional scaling program was used in this research. Described as a fairly robust, non-metric, data reduction algorithm (Nunnally, 1978), KYST utilizes as input data the mean similarity ratings (averaged over all participants) for each paired comparison. The data are used to construct a spatial representation of the perceived similarity of the units compared. Units placed close together or far apart in an array were perceived as very similar or very dissimilar.

KYST uses an iterative procedure to array the units in various dimensional spaces until the "best" spatial representation of the original similarity data is achieved. The goodness-of-fit between the graphical solution and the original mean comparison ratings is represented by an index known as "stress". A stress value is calculated for each iteration in a particular set of dimensions. Iterations cease when the incremental stress improvement is sufficiently

small. The result of this analysis is a physical representation of the map within which participants place work units on the basis of their cognitions of work unit structure.

The location of work units along the dimension underlying an MDS solution can be compared to the participant ratings of unit structures along the unit characteristics presented in Part Two of the survey. This information allows for the assessment of congruence, if any, between the dimensions used by participants to define work unit structures and those dimensions which comprise the traditional domain of the construct.

Dimension Identification/Interpretation

The first of two major analytical tasks is the identification of the number of dimensions in the solution which stress values indicate "best" represents the input data. A perfect fit of "n" units could be achieved in $n-1$ dimensions, with a stress value of zero. However, the dimensions would likely be difficult to interpret and would not represent a parsimonious description of the domain of structure. Thus, the goal of the MDS identification process is to recover that set of dimensions for which 1) stress values indicate good dimensional resolution; 2) dimension interpretation is straightforward; and 3) no clearer interpretation occurs in higher dimensional solutions (Karmel and Egan, 1976).

The second and more complex of the MDS tasks is the interpretation of the identified dimensional solution. To provide a complete

interpretation of the underlying map dimensions, a variety of interpretive procedures were employed. The rationale behind the use of multiple procedures was the desire to fully identify what variable(s) has (have) a systematic relationship with the positions of the work units along the various dimensions in the MDS configuration.

As "the easiest and most commonly used interpretive procedure" (Kruskal and Wish, 1978, p. 36), multiple regression was initially used to evaluate which of the rated structural characteristics, if any, might be appropriate interpretations of the cognitive structure dimensions produced by the MDS analysis. The regression procedure treats each of the various unit characteristics as "dependent variables" and the configuration coordinates for each unit as the "independent variables."

For each of the 17 units, mean ratings on each of the unit characteristics were regressed over the solution coordinates for that unit. The result is a weighted combination of the coordinates which best "explains" a particular characteristic. Significant ($p < .05$) regression coefficients within significant ($p < .05$) regression equations suggest that the dependent variable in an equation may be an appropriate interpretation for the dimension with the significant coefficients.

Regression analyses are preferred over simple correlational procedures. While the latter does represent the strength of association between sets of variables, the former provides the direction of the least squares line which maximizes the multiple correlation.

This directionality adds interpretive information lacking in the correlational approach.

In addition to the regression analyses two qualitative procedures were also used in the interpretive process. These included analyses of the importance ratings and content analysis of responses to the open-ended question seeking personal bases of comparisons.

RESULTS

Quality of Input Data

A number of procedures were used to assure that input data was of sufficient quality to warrant further analyses. Based on a 7-point scale (1-very unfamiliar to 7-very familiar), mean familiarity scores for each unit ranged from 3.70 to 4.37 (\bar{x} = 4.06; SD = 2.03). Seventy percent of the sample had average familiarity scores of 3.5 or greater, indicating that respondents were moderately familiar with the units compared.³

Respondents also indicated their confidence in being able to make the comparative judgments on the basis of unit structure on a bi-polar scale (1-not at all confident to 7-very confident). The average confidence rating was 4.04 (SD = 2.01). Respondents reported moderate levels of confidence in their ability to make comparisons on the basis of unit structure.

These moderate values need not cause concern unless the MDS solution suggests that the input data were randomly generated by respondents. It is assumed that individual perceptions are, of

necessity, based on incomplete information and that constructs other than structure may influence employee perceptions of that construct.

Stability of comparative judgments within the MDS task was evaluated by examining the ratings of the eight reversed pairs. Mean differences between the pairs presented in both directions were not significant ($p < .05$), and the correlation between the two sets of ratings was .85 ($p < .05$). These results suggest excellent stability in the comparison judgments despite the rather tedious nature of the task.

Stability of judgments over the four-week period between test and retest indicated good agreement between the 36 comparisons at two points in time. Mean differences ranged from .01 to 1.11 with none significantly different ($p < .05$). The Pearson product-moment correlation between these two sets of mean comparative judgments was .81 ($p < .05$).

Identification of the Appropriate MDS Solution

Four different MDS solutions were generated for preliminary examination. These arrays were constructed in solution spaces of from two to five dimensions. Each of the four MDS solutions yielded stress values indicating that the configuration had been developed on the basis of non-random data. Apparently the employees in this organization utilized some systematic cognitive map of work unit structures when making comparative judgments. Since relative stress values did not indicate a preferred solution, choosing the solution for interpretation involved a trade-off between the desire for solution parsimony and dimensional interpretability.

Two considerations led to the decision to interpret the five dimension solution. First, previous literature had suggested that the domain of structural dimensions may be large. James and Jones (1976) concluded that there were at least seven dimensions in the domain. Champion (1975) suggested that eight dimensions should be included, while Montarrai (1978) proposed at least 16 possible structural dimensions. Given the authors' wish to maximize information gained about possible cognitive dimensions of structure, the five-dimension solution seemed the likely candidate for interpretation.

A second consideration involved the extent to which the lower dimension solutions were contained in the five dimension outcome. Comparative analysis indicated that as the dimensionality of the solution space increases, dimensions from the previous solutions are maintained and new orthogonal dimensions are generated. Choosing the five-dimensional solution for interpretation provides all of the information present in the other solutions plus one additional dimension.

Space limitations preclude the presentation of the ten two-dimensional plots which arise from a five dimension solution. For illustrative purposes, however, a plot of Dimension 3 by Dimension 4 is presented in Figure 1. The rationale for selecting these particular dimensions will become apparent.

Insert Figure 1 about here

Despite the selection of the five dimension solution for interpretation, it should be noted that no pretense is made that this solution contains all of the underlying dimensions of structure. Other dimensions may exist but may have gone undetected due to lack of unit variation along a particular dimension or to the inability of the methodology to recover additional dimensions.

Interpretation of Dimensions

As indicated above, ratings of unit characteristics were collected from employees and unit supervisors. Archival information was also collected on unit size (FTE), average supervisory span of control, number of unit levels and unit complexity (number of different job titles). Perceptions of unit satisfaction and unit climate were also used in the analyses. All of these characteristics were regressed over the appropriate solution coordinates. Table 2 contains a summary of the results of this procedure. The table presents only those unit characteristics which when regressed over the MDS configuration yielded significant multiple correlations and significant standardized regression coefficients.

Two points must be made. First, although all of the different unit characteristics were analyzed by the regression technique, only those reported in Table 2 satisfied the significance criteria. Second, none of the unit characteristics satisfied the criteria for dimensions 3 and 4.

Insert Table 2 About Here

Given the relatively small number of observations (17) for a series of regression equations with five independent variables, the table also contains values for Nunnally's (1978) "shrinkage factor R." Examination of the results in the table suggests that three of the five solution dimensions can be interpreted by the regression procedure.

Dimension I--The first dimension represents a general bureaucratic/affective dimension including such characteristics as size (reported by the supervisor), and employee perceptions of centralization, complexity, satisfaction and climate.

Dimension II--The affective characteristics appear by themselves as the primary elements of the second dimension. Apparently, to individuals in the organization, "structure" generates a cognitive map which includes an affective component.

Dimension V--The objective size of the unit taken from company records appears to dominate at least one dimension along which individuals define the structure of work units. In previous structure literature, size has been classified as both a contextual and a structural variable. For this sample of employees the actual size of the unit does provide a unique dimension underlying the cognitive map of work unit structure.

While three of the five dimensions have been initially interpreted by the regression procedure, these results suggest that none of the unit characteristics would be appropriate interpretations of third and fourth dimensions in the MDS solution. To interpret the

underlying dimensions as completely as possible, two qualitative procedures were employed to interpret the third and fourth dimensions. These procedures may also provide confirmatory evidence for the regression interpretations of the first, second, and fifth dimensions.

The first of the qualitative procedures required an examination of the relative importance ratings assigned by respondents to those unit characteristics used in the regression analyses. Table 3 presents the rank-ordering of these characteristics based on mean importance

Insert Table 3 About Here

ratings averaged over all respondents. Also included in the table is the percentage of respondents who considered a particular characteristic of at least moderate importance (responses of four or greater) in making the comparisons.

Examination of the table reveals that "non-traditional" structural characteristics were ranked of first and second importance by respondents. In particular, type of unit product/service received a mean importance rating of 5.56 with 89.8% of the respondents indicating that the characteristic was of medium to high importance in making the structural comparisons. Unit performance level was of medium to high importance to 73.4% of the sample with a mean importance rating of 4.67. Since neither unit product nor unit performance yielded significant regression results, both could be

considered as candidates for either of the remaining dimensions. A similar statement could also be made about perceived unit standardization.

It should be noted that the characteristics rated may reflect only a subset of the characteristics actually used by respondents. Additionally, since these characteristics were supplied by the researcher, respondents may have inflated their actual importance in the comparisons. It may have been assumed that such factors would not have been included for rating if they were unimportant.

The MDS task allowed participants to implicitly define their cognitive dimensions of work unit structure. The regression procedure and the relative importance analyses limited the interpretation of these dimensions to the a priori set of unit characteristics. To this point in the research a social definitionist data collection process has been combined with an admittedly social factist approach to dimensional interpretation.

The final interpretive procedure comes closer to what the pure social definitionist would likely consider an acceptable interpretive methodology. By examining individual responses to the open-ended survey question asking for a list of factors used in making the comparative judgments it may be possible to provide interpretations of dimensions 3 and 4 as well as informally assess the viability of those interpretations made earlier.

A content analysis of responses to this question is presented in Table 4. The table presents, in rank-order of frequency of mention,

eight general categories of unit characteristics identified by at least 8% of the respondents. Also included are sample comments from each category. Examination of the table reveals both similarities and differences between the most frequently listed content areas, the regression results and the relative importance ratings.

Insert Table 4 About Here

The most apparent difference is the appearance of a factor identified as the extent of "interdependence" of a unit with other work units. The identification of unit interrelationships as a possible structural dimension is intriguing. While unit interaction has not been a frequent member of a priori structural domains, a number of authors have labeled this characteristic as a potential dimension of structure (James and Jones, 1976; Indik, 1968; Sells, 1963).

The categories of unit product/service, unit personnel and dominant unit technology are closely related to the unit function characteristic previously identified as important to respondents. The acceptability of unit function as a dimension in the cognitive map of structure gains additional support from these results.

The remaining content areas reflect structural characteristics previously identified in the regression procedure. The administrative structure category included such responses as location of decision-making, span-of-control, and number and kinds of different jobs. The satisfaction/climate category included such responses as

morale, climate, managerial styles and overall unit attitude. These results provide additional validity evidence for both of the preceding interpretive procedures.

These procedures also suggest the following possible interpretations for dimensions 3 and 4: unit function, unit interrelationships, unit performance and unit standardization. The latter two characteristics did not appear as significant interpretations in the regression analyses, nor were they mentioned in response to the open-ended question. Therefore, they may not be as viable interpretations as the two former characteristics. Unit function appeared as a possible interpretation in both qualitative procedures, while the presence of unit interrelationships in the content analysis supports the salience of this characteristic to respondents. Figure 1 presents the array of the 17 work units along the third and fourth dimensions of the MDS solution. With some minor discrepancies in particular unit locations, the function and interaction labels seem appropriate dimension interpretations.

Dimension III--Units vary on along the third dimension on the basis of locus of unit interaction. Units are arrayed from those interacting within the organization to those interacting with constituencies external to the organization. At one extreme of Dimension III are the engineering units with interactions limited to elements of the production process. At the other extreme of the dimension are those units which interact with publics (customers, sales representatives, transportation agencies, etc.) external to the organization.

Dimension IV--Along the fourth dimension the units are ordered on the basis of unit function. The basic production units (production services, bottling, mixing, maintenance) are clustered at the top of the dimension, followed by personnel functions (compensation and employment), engineering functions and finally acquisition functions.

DISCUSSION

The research presented here was designed from an alternative approach to organizational research. Rather than positing the existence of certain structural dimensions a priori, and then soliciting participant responses on scales measuring those dimensions, we recovered the structural dimensions of a cognitive map by which participants define work unit structures. This research assumed that the descriptions individuals make of the structures of work units are related to cognitions of those structures. It was further assumed that these descriptions can be meaningfully organized into some cognitive schema (Calder and Schurr, 1981). Finally, we assumed that a representation of this cognitive orientation could be recovered and interpreted using a multidimensional scaling procedure. The results reported provide substantial evidence that such assumptions are valid, and that such maps do exist.

Based on similarity ratings of unit structures, an MDS analysis considered the nature of the cognitions of work unit structures within an organization. The results of the analyses suggest that

MDS provides a viable methodology for recovering such cognitions. As such, it provides an empirically rigorous procedure for allowing individuals to define salient aspects of their work environment. Various interpretive procedures indicated that five cognitive dimensions of structure could be labeled bureaucratic, affective, locus of unit interaction, unit function, and objective size.

As a participant-centered alternative to the traditional structural domains, the results presented here represent an apparent synthesis of much of that earlier work. Rather than identifying independent bureaucratic characteristics such as centralization, complexity, etc., these traditional dimensions of structure were perceived by participants as collectively representing some general bureaucratic profile of a unit structure. From an individual perspective, the results of this research would appear to support Child's (1974) contention that "the bureaucratic concept is still useful for describing one aspect of structure" (p. 247, emphasis added).

Two of the other cognitive dimensions have previously been labeled dimensions of structure, though not as frequently as the Weberian characteristics. Locus of unit interaction and unit size appear in structural domains identified by James and Jones (1976). It is particularly interesting that size of the work unit appears in a cognitive domain of work unit structure, since it has more frequently been considered an element of unit context. Although respondents did not consciously rate size as an important factor in

making their paired comparisons, the apparent influence of size (or some co-variate of size) was sufficiently marked to suggest its inclusion in the MDS solution.

Unit function and locus of interaction seem to be related to the nature of work unit technology, another well-known contextual variable. Unit function and unit interactions will likely be determined by organizational or work unit technologies. The relationship between technology and structure has long been debated at the organizational level of analysis. Results presented here would suggest that some type of relationship exists at the individual level, such that perceptions of technology influence dimensions along which unit structures are perceived and differentiated. The conceptual distinction which is made between technology and structure at the organizational level is somewhat blurred at the cognitive level.

These results should prompt a continued consideration of Sathe's suggestions concerning the possible existence of two general structures within organizations and (by inference) within work units (Sathe, 1978). Sathe labels the formal structure designed and imposed by top management as a design structure. Since these design structures tend to be rigid and unchanging, a structure emerges to cope with day-to-day operational requirements. This emergent structure is sufficiently flexible to meet the varying demands of changing work conditions.

The cognitive domain isolated above contains elements from both design and emergent structures. The bureaucratic and size dimensions appear to reflect elements of Sathe's design structure, while

unit function and locus of interaction reflect elements of an emergent structure to the extent that day-to-day activities are facilitated by function and interaction. From the individual's perspective, Sathe's distinction seems valid, as dimensions from both structures determine the nature of structural cognitions.

The presence of the affective characteristics in two of the map dimensions prompts several comments. First, while a purely affective dimension was recovered, it clearly did not dominate the cognitive map as had been suggested. Second, the results suggest that one can, indeed, generalize from the findings based on maps of individual social structures to the maps based on work unit structures. While the second dimension was clearly affective in nature, the results for the first dimension indicate a possible reflection of individual evaluation of the specific bureaucratic characteristics salient to the respondents.

Given these results, it could be argued that respondents knew as much (or more) about perceived affective differences between units than about structural differences. In the absence of knowledge about unit structure, the basis for comparison ratings became perceptions of work unit satisfaction/climate. It might also be argued that affect could be related to some unidentified structural dimension, or that the dimension represents a generalized affective response to a generalized interpretation of structure. Finally, the affective dimension could be the result of the non-structure variance which individuals perceive between work units. Whatever the

rationale, the results strongly support the inclusion of an affective dimension in the cognitive map.

Research Limitations and Implications for Future Research

While the intent of this research was to reduce the a priori imposition of systematic constraints on research outcomes, certain limitations do remain. This work was conducted within a single organization, reducing the generalizability of these results. The restriction of data collection to a single organization may have restricted both possible variance in work unit structure and employee perceptions of those structures.

Research constraints were imposed on the a priori characteristics provided for the judgments of relative importance and unit descriptions. A more comprehensive listing of unit characteristics may have provided different results. However, the validity of the dimensional interpretations is increased to the extent that support for the regression results was provided by the other interpretive procedures.

Given these limitations, the most pressing research needs are those directed at reducing or eliminating these shortcomings. Replications of this research in organizations of differing type and context would be appropriate. Beyond replications, it seems appropriate to investigate the extent to which the dimensions identified here actually exhaust the domain of possible dimensions.

From an individual perspective, it would be of interest to examine differences in individual cognitive maps as they compare to an

aggregate map. It would also be interesting to investigate the impact, if any, of differing structural cognitions on individual behaviors and attitudes in an organizational setting.

At the organizational level, the cognitive orientation of elite decision makers as input into organizational decision making in general and structural alignment in particular has recently received attention (Anderson & Paine, 1975; Bobbit and Ford, 1980; Child, 1972; Hage and Dewar, 1973; Montanari, 1978). Sensitivity by top management to differing cognitions of structure within the organization could greatly influence the success of organizational change strategies. An examination of the relative congruence between elite cognitions and cognitions of other organizational participants becomes a matter of research and applied interest.

CONCLUSION

There is little doubt that the debate over the research efficacy of various research paradigms will continue. The present research was undertaken in the belief that such debate can only prove beneficial to the organizational sciences. The choice of structural dimensionality as the vehicle for presenting an alternative research approach yielded a conceptualization of the construct distinct from that traditionally presented.

We re-iterate our contention that differing approaches need not be perceived as competitive. Rather a complimentary perspective must be adopted through which a more complete picture of organizational functioning might be drawn. We argue that the exploration of

organizational questions from a variety of perspectives is a valuable process and useful in the evolution of the science of organizations. Thus,

"The challenge is not to decide upon superior methods. The challenge is to embrace diverse methods that pursue several realities, and to distinguish quality in each." (Daft, 1980, p. 633)

Footnotes

¹This research is based upon the first author's dissertation conducted at the University of Wisconsin-Madison (1980). The authors would like to thank Randall B. Dunham, Kim Cameron, M. Susan Taylor and Ron Serlin for their helpful comments during the preparation of this manuscript. Financial support for conducting this research was provided by the Richard D. Irwin Foundation, the Graduate School at the University of Wisconsin-Madison, and the School of Business Administration at the University of North Carolina at Chapel Hill.

²Whether or not the two conditions would provide different results was treated as an empirical question. Comparative analysis of the input data indicated strong similarity between the two conditions. Thus, data were combined into a single sample for all MDS analyses.

³When respondents were divided into three subsamples ($n = 60$ each) reflecting by definition, low, medium, and high familiarity with the units compared, analyses for each sample indicated that increased familiarity with the units resulted in slightly better resolution of the input data by the MDS procedure. However, comparative analyses of the three maps indicated that they are virtually identical. Although some members of the organization have been labeled as having low familiarity with the units compared, the level was evidently sufficient to allow meaningful comparisons between the many units.

REFERENCE NOTES

1. Hackman, R. Personal communication, March 1978.

Schneider, B. Personal communication, February 1979.

REFERENCES

1. Anderson, C. R. and Paine, F. T. Managerial perceptions and strategic behavior. Academy of Management Journal, 1975, 18, 811-823.
2. Benson, J. K. Innovation and crisis in organizational analysis. The Sociological Quarterly, 1977, 18, 3-16.
3. Berger, C. and Cummings, L. L. Organizational structure, attitudes and behaviors. In B. Staw (ed.), Research in Organizational Behavior, Vol. 1, Greenwich, Connecticut: JAI Press, 1979, 169-208.
4. Blackburn, R. S. Dimensions of structure: a review and re-appraisal. Academy of Management Review, in press.
5. Bobbit, H. R., Jr., and Ford, J. D. Decision-maker choice as a determinant of organizational structure. Academy of Management Review, 1980, 5, 13-23.
6. Calder, B. J. and Schurr, P. H. Attitudinal processes in organizations. In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, Vol. 3, Greenwich, Connecticut: JAI Press, 98 , 283-302.
7. Champion, D. J. The Sociology of Organizations. New York: McGraw-Hill, 1975.

8. Child, J., Organizational structure and strategies of control:
A replication of the Aston study. Administrative Science Quarterly, 1972, 17, 163-176.
9. Child, J. Comments on Reimann and Mansfield's 'Bureaucracy'.
Administrative Science Quarterly, 1974, 19, 247-250.
10. Daft, R. L. The evolution of organizational analysis,
1959-1979. Administrative Science Quarterly, 1980, 25, 623-636.
11. Dalton, D. R., Todor, W. D., Spendolini, M. J., Fielding, G. J.
and Porter, L. W. Organizational structure and performance: A
critical review. Academy of Management Review, 1980, 5, 49-64.
12. Ford, J. D. Context, leader initiating structure and subunit
structure. Proceedings, Midwest Academy of Management Meetings,
1977, 76-87.
13. Ford, J. D. Institutional versus questionnaire measures of
organizational structure: a re-examination. Academy of Manage-
ment Journal, 1979, 22, 601-610.
14. Hage, J. and Dewar, R. Elite values versus organizational struc-
ture in predicting innovation. Administrative Science
Quarterly, 1973, 18, 279-290.
15. Hall, R. H. Organizations: Structure and Process (2nd ed.)
Englewood Cliffs, New Jersey: Prentice-Hall, 1978.

16. Holdaway, E. A., Newberry, J. F., Hickson, D. J. and Heron, R. P. Dimensions of organizations in complex societies: The educational sector. Administrative Science Quarterly, 1975, 20, 37-58.
17. Indik, B. P. The scope of the problem and some suggestions toward a solution. In B. P. Indik and F. K. Berren (eds.), People, groups and organizations. New York: Teachers College Press, 1968.
18. James, L. R. and Jones, A. P. Organizational structure: A review of structural dimensions and their conceptual relationships with individual attitudes and behavior. Organizational Behavior and Human Performance, 1976, 16, 74-113.
19. Jones, L. E. and Young, F. W. Structure of a social environment: Longitudinal individual scaling of an intact group. Journal of Personality and Social Psychology, 1972, 24, 108-121.
20. Kaman, V., Shiklar, R., and Hautaluoma, J. Perceived social structure, role, and communication patterns in an organization. Journal of Vocational Behavior, 1979, 15, 265-276.
21. Karmel, B. and Egan, D. M. Managerial performance: A new look at underlying dimensionality. Organizational Behavior and Human Performance, 1976, 15, 322-334.
22. Kim, M. P., and Rosenberg, S. Comparison of two structural models of implicit personality theory. Journal of Personality and Social Psychology, 1980, 38, 375-389.

23. Kruskal, J. B. and Wish, M. Multidimensional Scaling. Sage University paper series on quantitative applications in the social sciences, 07-011. Beverly Hills: Sage Publications, 1978.
24. McKelvey, W. Guidelines for the empirical classification of organizations. Administrative Science Quarterly, 1975, 20, 509-525.
25. Montanari, J. R. Operationalizing strategic choice. In J. H. Jackson and C. P. Morgan, Organizational Theory: A Macro Perspective for Management, Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1978, 286-298.
26. Morgan, G. Paradigms, metaphors, and puzzle solving in organization theory. Administrative Science Quarterly, 1980, 25, 605-622.
27. Nunnally, J. C. Psychometric Theory (2nd Ed.). New York: McGraw-Hill, 1978.
28. Pierce, J., Dunham, R. B. and Blackburn, R. Social systems structure, job design, and growth need strength: A test of a congruency model. Academy of Management Journal, 1979, 22, 223-240.
29. Pondy, L. R. and Boje, D. M. Bringing the mind back in: Paradigm development as a frontier problem in organization theory. Unpublished paper, Department of Business Administration, University of Illinois, 1976.

30. Pondy, L. R. and Mitroff, I. I. Beyond open system models of organization. In B. Staw (ed.), Research in Organizational Behavior, Vol. 1, Greenwich, Connecticut: JAI Press, 1979, 3-39.
31. Porter, L. and Lawler, E. E., Jr. Properties of organizational structure in relation to job attitudes and job behavior. Psychological Bulletin, 1965, 64, 23-51.
32. Pugh, D. S., Hickson, D. J., Hinings, C. R., and Turner, C. Dimensions of organizational structure. Administrative Science Quarterly, 1968, 13, 65-105.
33. Reimann, B. On the dimensions of bureaucratic structure. Administrative Science Quarterly, 1973, 18, 462-476.
34. Ritzer, George. Sociology: A multiple paradigm science. The American Sociologist, 1975, 10, 156-167.
35. Salancik, G. R., Calder, B. J., Rowland, K. M., Leblebici, H., and Conway, M. Leadership as an outcome of social structure and process: A multidimensional analysis. In J. Hunt and L. Larson (eds.), Leadership Frontiers. Kent, Ohio: Kent State University Press, 1975.
36. Sathe, V. J. Institutional versus questionnaire measures of organizational structure. Academy of Management Journal, 1978, 21, 227-238.

37. Schwab, D. Construct validity in organizational behavior. In B. Staw and L. L. Cummings (eds.), Research in Organizational Behavior, Vol. 2, Greenwich, Connecticut: JAI Press, 1980, 3-44.
38. Sells, J. B. An interactionist looks at the environment. American Psychologist, 1963, 18, 696-702.
39. Van de Ven, A. H. A framework for organization assessment. Academy of Management Review, 1976, 1, 64-78.

TABLE 1
Sample Demographics

Demographic Variable	Respondent Sample
Age - Modal Range	35-39 years
Sex	61% Male - 39% Female
Average Educational Level	Completed 2 years Post-Secondary Education
Tenure with the Firm - Modal Range	9-12 years
Salary Classification	42% exempt - 58% non-exempt

TABLE 2

Multiple Regression Results: Unit Characteristics
and MDS Dimension Coordinates

Unit Characteristics	Dimension Coefficients					R	Shrinkage R
	1	2	3	4	5		
Size (P ^a)	.572 ^b					.79*	.70
Centralization (P)	-.755				.352	.85*	.80
Complexity (P)	-.484	.402				.80*	.71
Climate (P)	-.608	.516				.81*	.73
Satisfaction (P)	-.529	.492				.80*	.72
Size (A)					.642	.81*	.73

^aP = Perceptual Measures

A = Archival Measures

^bDimension coefficients are beta weights, and only weights significant at $p < .05$ are reported.

* $p < .05$.

TABLE 3

Rank-Order Importance of A Priori Structural, Affective,
and Performance Characteristics in MDS Paired Comparisons

Unit Characteristics	Mean Importance Rating	% of Respondents Indicating Medium to High Importance
Unit's Product/Service	5.56	89.8%
Performance Level	4.67	73.4
Standardization	4.01	62.9
Number of Levels	3.83	58.2
Centralization	3.81	59.3
Complexity	3.78	57.1
Satisfaction in Unit	3.63	49.2
Formalization	3.60	50.8
Number of Supervisors	3.34	47.5
Size of Units	3.23	45.2

TABLE 4
Rank-Order of Content Areas Used in Making MDS Paired Comparison
(Including Sample Comments)

Characteristics	% of Respondents Citing Characteristics
Interdependency/Interrelationship	27%*
-"How they are related"	
-"Does the work move between them?"	
-"Relationship between units"	
Unit/Product/Service/Function	25%
-"What they do"	
-"What they make"	
Unit Personnel	20%
-"Number of union workers"	
-"Union vs. Non-union"	
-"Professionals vs. Non-Professionals"	
Dominant Unit Technology	20%
-"Type of work done"	
-"How they do the job"	
-"Their production process"	
Unit Administrative Structure	10%
-"Span of Control"	
-"Decision-making location"	
Line vs. Staff	9.5%
Unit Satisfaction/Climate	9
-"Unit morale or satisfaction"	
-"Managerial style"	
-"Personality of unit"	
Size	8%

*NOTE: Total percentages exceeds 100%, since multiple responses were possible.

FIGURE
MDS CONFIGURATION:
Dimension III (X-axis) vs. Dimension IV (Y-axis)

